

Harnessing chirality: molecules, light, properties and applications

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Chirality is a fundamental aspect of Nature, from elementary particles to Chemistry of life. Since early days, chemists have always been fascinated by chirality and they have learned how to prepare and investigate chiral compounds. In recent years, chirality has experienced a new renaissance. Chiral organic materials are finding applications in chiral electronics, e. g. in circularly polarized (CP)-OLEDs, CP-sensitive transistors, spin filters, etc. Such a surge in interest requires the development of new chiral materials and a more complete understanding of structure-property relationships.

In particular, luminescent chiral molecules can emit left and right CP light with different intensities. This phenomenon is called CP luminescence (CPL) and can be exploited both spectroscopically and in various applications. We have developed and investigated purely chiral organic molecules,¹ lanthanide-based chiral coordination compounds² and aggregates of chiral small organic molecules in thin films capable of CPL activity.³ Each class of compounds has peculiar chiroptical properties, arising from their intrinsic nature, and therefore different features and potentialities, which will be discussed during the lecture. Moreover, we have seen that chirality plays a role in spin crossover dynamics in coordination compounds, which can be regulated by controlling the stereochemistry of the complex through chiral anions.⁴

Chirality offers a wide playground for chemists and other scientists, where a true progress can only be achieved through a cooperation among different scientific fields.

References

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